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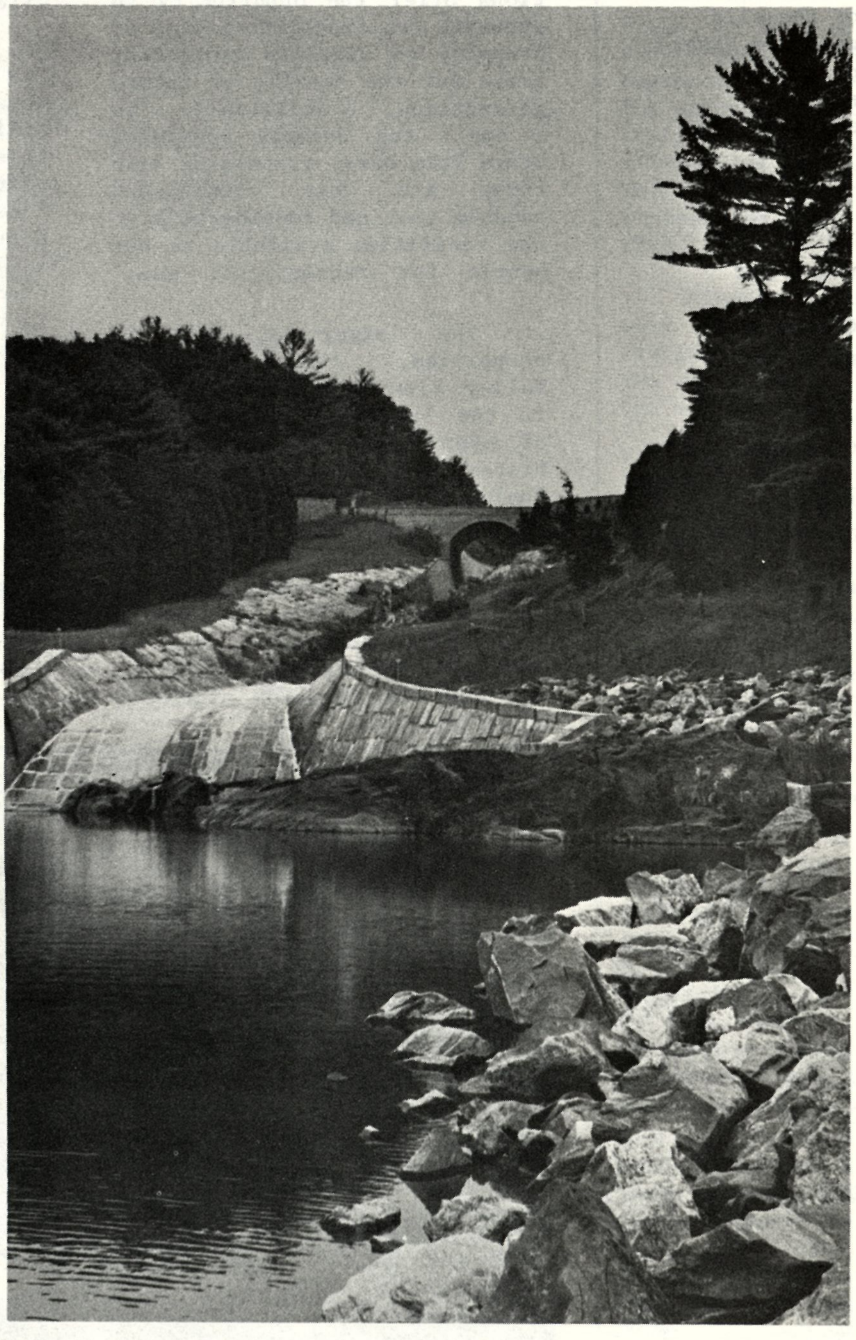
Citizens' Bulletin

Volume 9 Number 10 June 1982 $5/yr.
The Connecticut Department of Environmental Protection



A drop to drink

Citizens' Bulletin

June 1982
Volume 9 Number 10 $5/yr.

Cover Photo: Martina Delaney; Metropolitan District Commission's Compensating Reservoir, Barkhamsted

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DEP Citizens' Bulletin
(USPS 041-570)

Published eleven times a year by the Department of Environmental Protection. Yearly subscription $5.00; two years, $9.00. 2nd class postage paid at Hartford, Connecticut. Funds are also provided through a federal grant from the Office of Coastal Zone Management under the Coastal Zone Management Act of 1972. Please forward any address change immediately.

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Open space donation is largest ever

At a brief ceremony on April 15, 1982, Governor William A. O'Neill signed the documents completing the transfer of an almost 2,000 acre tract in Harwinton from the Lewis B. Roraback Trust to the State of Connecticut. O'Neill also announced the acquisition of a property in Westbrook which includes the 75-acre Messerschmidt's Pond.

"These valuable acquisitions offer the opportunity to preserve two excellent pieces of property as wildlife management areas for the benefit of future generations," O'Neill said. "In a small and densely populated State like ours, properties like these are very significant because they add considerably to the facilities available to our people for recreational use."

The larger of the two properties, the 1,977-acre Valley View Farm in Harwinton, is the largest single donation of open space in the State's history, the Governor said. It includes approximately six miles of potential trout fishing area on Lead Mine Brook and Rock Brook as well as a 15-acre pond. Much of the area consists of former farm land now reverting to its natural state, which offers ideal opportunities for wildlife management.

"The State," O'Neill said, "is extremely grateful to the Roraback family for this magnificent gift. Not only will this land provide excellent wildlife management opportunities itself, the gift, with an appraised value of $3,475,000, will also provide the State with credits for additional acquisitions of up to three times that value."

J. Henry Roraback assembled the farm and bequeathed it to his son, Lewis B. Roraback, who established the trust providing for the donation of the land to the State. The area will be

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"The Connecticut Department of Environmental Protection is an equal opportunity agency that provides services, facilities and employment opportunities without regard to race, color, religion, age, sex, physical handicap, national origin, ancestry, marital status or political beliefs."

Trustee Alfred R. Bangston; Charles R. Moore, Jr., of Gross, Hyde, and Williams; Walter J. Connolley, Jr., Arthur L. Hollings, and Crawford E. Hindermann, Jr., of Connecticut Bank and Trust Company; and DEP Commissioner Stanley J. Pac joined Governor William O'Neill for the signing which completed the transfer of Valley View Farm to the State.

Drinking water contamination

By Audrey Handelman,
Environmental Intern

> "'We can minimize the effects, but we can't return the area to its pre-contaminated state'"

The Town of Brookfield

Early in 1979, residents of the Meadowbrook Road area in Brookfield noticed a gasoline-like taste and smell to their water. Testing by DEP's Water Compliance Unit confirmed that what the redidents tasted and smelled was indeed gasoline.

DEP concentrated its efforts on investigating the Elmco gas station, the most likely source of the contamination since it was the only gas station within three-quarters of a mile of the neighborhood. Although both olfactory examination and laboratory analysis failed to indicate the presence of gasoline in the station's own well water, DEP insisted that Elmco test all of its underground tanks and pipes for leaks.

At a meeting held in early spring 1979, Elmco disclosed that a "small" spill--estimated at 100 to 200 gallons--had occurred in January, and the company agreed to have all of its in-ground tanks tested. But this testing indicated no leakage in any of the tanks, lines, or pumps.

Relatively high levels of hydrocarbon contamination persisted in the Meadowbrook Road wells into the summer, however, casting doubts on the validity of the tests. In late July 1979, DEP issued an order to Elmco to "investigate the extent of groundwater contamination caused by past and/or present transfer and storage of petroleum products" at their station. In addition, the order called for Elmco to provide for removal or treatment, so far as possible, of soil and groundwater, and to submit by September 30 an engineering report describing the nature and extent of contamination and possible means for eliminating it. Elmco was to verify that such means had been implemented by December 30, 1979.

Elmco was late in submitting that report. Extensive testing, not begun until after the specified date, lasted into the spring of 1980.

Bob Nenadal, who lives in the area with his wife Kathleen and his family, recalls the ordeal he and his neighbors went through in the meantime as a result of the contamination of their wells. Fearing to drink their water, the group of residents had appealed to the Town of Brookfield for help in the spring of 1979. The town suggested that they obtain water from an outdoor spigot at a local school. "This was a nightmare," says Nenadal. "Every time you got water you had to let it run enough to flush the rusty particles out of the pipe. This became tricky to do at night, as there were no outdoor lights."

The families involved, Nenadal's included, had also been warned by the State Department of Health Services (DOHS) that they should not bathe in their water. They appealed to the town, asking to use the local high school locker room showers to bathe. They were informed that they might use the showers late in the evening, but that once the basketball season began the hours would be even later. This solution presented obvious problems for families with small children.

An agreement, to which Elmco was bound by court order, took effect late in the summer of 1979. According to the agreement, Elmco would supply the residents with bottled water, pay for the installation and upkeep of charcoal filters, and conduct monthly tests for any residents whose water was not drinkable.

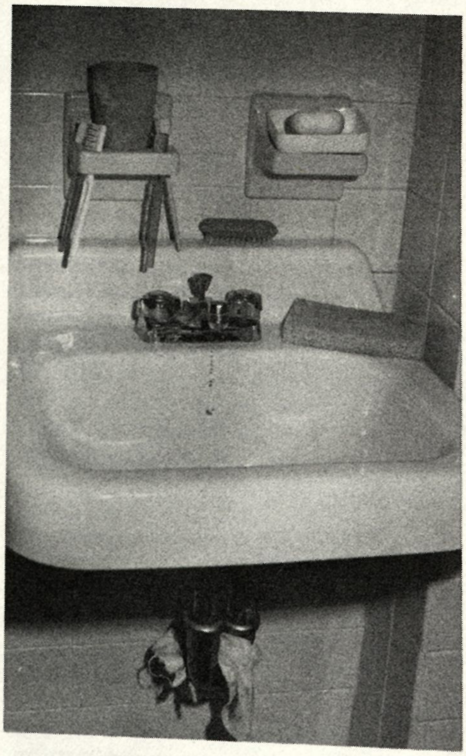
In the spring of 1980, DEP principal sanitary engineer Michael Harder visited the Elmco site with DOHS staff. "Visual inspection told us that the danger of contamination was still significant," Harder says. The position of the tanks and visible damage to the pipes revealed that the problem had not yet been adequately taken care of. As a result of this inspection, Elmco was ordered to shut down the station until it could be verified that all contamination had ceased.

Elmco actually shut down before the order was issued. In a recent letter to the Brookfield Journal, Harder pointed out that following its initial reticence, Elmco had been very cooperative. "This Department does not have the authority to require that bottled water be provided to the affected residents or that carbon filters be installed and maintained or that periodic tests be run on the residents' well water," Harder wrote. "In fact, this is the only case that I know of in Connecticut where persons whose water supplies have been contaminated have been given these services. If the Elmco people wanted to, they could have refused to do this, and the situation would be much more critical than it is now."

The fact that the situation might be worse did little to ease the hardships suffered by the residents, Harder admits, although he says, "There has been a great deal of improvement in attitude since the whole thing began. At first there were a lot of angry, concerned townspeople. Everyone has become much more cooperative in their efforts to do something about the problem."

Physical solutions to the problem are often impeded by legal restrictions. For about a year, water was pumped from a recovery well near the Elmco site, through an aeration tank, and back into the ground by way of a leaching system. As a result of the well drawdown, which acted to lower the water table in the surrounding area, gasoline accumulated in the well and was removed periodically. Early in 1981 it became clear that the quantities of recoverable gasoline accumulating in the recovery well were decreasing, and it was decided that more wells should be dug. The first recovery well has been temporarily shut down until the other wells are completed.

DEP's Water Compliance Unit has issued a permit to discharge water drawn from the two new wells into Limekiln Brook, which runs behind the Meadowbrook area, via storm drains. Residents were not happy with this, but according to Harder, this action is preferable to the alternative of discharging into the open fields. "With the discharge going into Limekiln Brook, it will be going into a surface water body and so will be significantly diluted," he says.



That there exists no "perfect" solution which will satisfy all parties points to the sobering facts of water contamination, especially groundwater contamination. As DEP Commissioner Stanley Pac said of the Brookfield case in a letter to Congressman Toby Moffett, "The fact of the matter is that gasoline contamination of an aquifer is a long-term condition; attempts to recover the lost gasoline help to speed up the renovation process and limit extent and degree of the problem, but even under the best of conditions gasoline-tainted water will persist, probably for years."

Contamination investigation procedures

Investigation and clean-up of water contaminants is further complicated by a variety of factors, including lack of communication between citizens, government, and industry, lack of understanding, and lack of money. In addition, the source of a particular contaminant may be difficult to determine; the accused party may deny liability; contamination may come from

> "'. . . even under the best conditions gasoline-tainted water will persist, probably for years'"

a long-abandoned site; and, too often, rational thought may give way to emotionalism and sensationalism.

In order to ease these complications somewhat, DEP's Water Compliance Unit drew up, in February 1980, a procedure to be followed in the investigation of chemical waste dump sites and other suspected contamination sites. An effort was made to coordinate the activities of several different agencies: DEP's Water Compliance, Hazardous Materials Management, and Solid Waste Units; the Water Supplies Section of DOHS; and regional and local health departments. The procedure was outlined in three phases.

The first phase involves determining the nature and the source of the problem. Water Compliance district engineers, assisted by staff from other units, make these determinations. Staff review pertinent agency files on the area to estimate the degree of hazard presented by an uncontrolled hazardous waste site at a particular location. (An uncontrolled site is one which is subject to leaching or one in which the contaminant is not physically contained.) Finally, the staff of the Hazardous Materials Management Unit make a field inspection of the suspected site.

In the second phase of the investigation, the Land Disposal Section of the Water Compliance Unit determines the extent of the contaminant plume, and DOHS determines the type of water use in the area. This water-use analysis, which tells whether the groundwater is used for public or for private wells, is made so that any action taken will be in keeping with the area's water use. For example, if it appears that no groundwater is being used for any purposes in the area, the situation is less serious than if the groundwater were used for public water supply.

The Land Disposal Section then supervises the transposing of U.S.G.S. topographic maps onto local maps to identify the local areas affected. Once the wells which lie within the contaminant plume have been located and well completion reports have been obtained--this being accomplished jointly by Land Disposal and Hazardous Materials Management--Hazardous Materials Management notifies the chief elected official of the municipality involved and provides a list of potentially affected well-owners.

If no wells exist within the contaminant plume itself, the Land Disposal Section identifies nearby wells which should be sampled, and the Water Supplies Section of DOHS takes samples from one or two wells closest to the source or most likely to be contaminated. DOHS notifies other property owners, in coordination with local health departments, to arrange for further sampling. Finally, the Water Supplies and Toxicology Sections of DOHS make recommendations for water use, such as restrictions on bathing and drinking, which they deem appropriate.

In the third phase of the procedure, local sanitarians or the staff of local health department officials, supervised by the Water Supplies Section of DOHS and the Land Disposal Section of Water Compliance, are responsible for collecting and analyzing samples from all wells in and bordering the contaminant plume. The Land Disposal Section reviews the data collected, delineates the final boundaries of the contaminant plume, and prepares a brief report on the results and conclusions to date.

The staff of the Hazardous Materials Management Unit researches land and business records on the area to better understand the circumstances surrounding waste disposal in the area and determine who is responsible for the contamination. The staff then recommends clean-up actions, exploring various methods and assessing their feasibility. As deemed appropriate by Water Compliance district engineers, water pollution orders may be issued to responsible parties, directing them to determine the precise nature and extent of surface and groundwater contamination and to determine measures necessary to alleviate the situation.

The procedure seems well-defined, if not simple, on paper. In practice, however, as we have seen with the case of Brookfield, water contamination problems are not so easily analyzed or remedied. There are personal, logistical, and physical as well as legal constraints. Choices must often be made between two undesirable options, with decisions based on a "lesser of two evils" philosophy. There may be as many different and conflicting versions of a water contamination story as there are parties involved. The situation is further complicated by the fact that procedures used to deal with public water supply contamination differ from those used to deal with contamination of private supplies.

Public water supply problems

It is generally considered the responsibility of the water utility company to supply its customers with clean, safe drinking water which is also aesthetically pleasing, that is, for example, not over-chlorinated. In addition, the company must make sure that there are no leaks or disfunctions along the many miles of lines and do all this at a price affordable to the consumer.

In 1974, the Federal Safe Drinking Water Act was passed, stating that all public water supplies should be checked for certain chemical contaminants and organisms, and that the levels of these contaminants, if excessive, should be reduced. The State Department of Health Services is responsible for administering the Safe Drinking Water Act for Connecticut, and thus has ultimate control over all public water supplies. The Water Supplies Section of DOHS must determine the drinkability of any water supply, either by making sure that the supply complies with specific parametric standards or by judging other factors which may or may not be included under the standards. Part of DOHS' jurisdiction over water systems includes watching water companies closely and making sure that they run their operations in accordance with federal regulations. In cases where they are not doing so, DOHS has the authority to put the companies on "compliance schedules," under which they must raise their standards within a specified period of time.

Richard Woodhull, former chief of the Water Supplies Section of DOHS pointed out, however, that the question of contamination is often a matter of perspective. "Our ability to detect these substances has increased dramatically in the last few years. There is no way of knowing whether the substances were always there. Most of them have probably always been present, but in such minute quantities that we could not detect them and should not be concerned about them now."

Emergency response program

In addition to so-called "routine" disposal and investigation procedures, DEP realizes that accidents requiring immediate attention may occur and has for this reason set up its Emergency Response Program. The program, in effect since 1969, deals primarily with uncontrolled discharges, oil and chemical spills, and leaking storage tanks. There are presently six full-time staff members responding on a 24-hour-a-day, 365-day-a-year basis. According to William Hegener, the engineer in charge of the program, spills personnel respond to an average of 800 to 900 calls a year. "We investigate the calls depending upon their urgency," Hegener says. "We try to find out the facts, find out who is responsible." The long-term impacts of these spills are analyzed under the procedures outlined above.

Emergency Response Program telephone lines are manned around the clock, and, says Hegener, "State Police, fire departments, and most local authorities have our number. Citizens should be able to find it fairly easily." These emergency measures are of little help, however, if, as in the Brookfield case, a spill is not reported immediately and evidence of it does not appear until months later.

Private wells and other aspects of water contamination

According to Dick Barlow, Assistant Director of DEP's Water Compliance Unit, "There are many problems citizens don't seem to realize or take into account. Once a contaminant such as gasoline is in the groundwater, there's really not much we can do about it. We can't wave a magic wand and make the problem go away -- that's what many people in Brookfield seemed to want. We can minimize the effects, but we can't return the area to its pre-contaminated state."

A private citizen who suspects his well has become contaminated should contact his local health department or district and describe the nature of the problem. Local health departments can supply the names of private laboratories certified to do analyses of drinking water or, if the nature of the problem warrants, may investigate a situation. DOHS offers technical assistance to local health departments.

Citizens should be aware that scans for the usual array of contaminants are not all that expensive but more specialized tests can become costly, so these are not usually recommended unless there is some basis for suspecting contamination. Some contaminants, such as gasoline, have low odor threshholds, so affected users are likely to recognize their presence readily. ■

Treatment plant . . .

the many steps to clean, safe, aesthetically pleasing drinking water

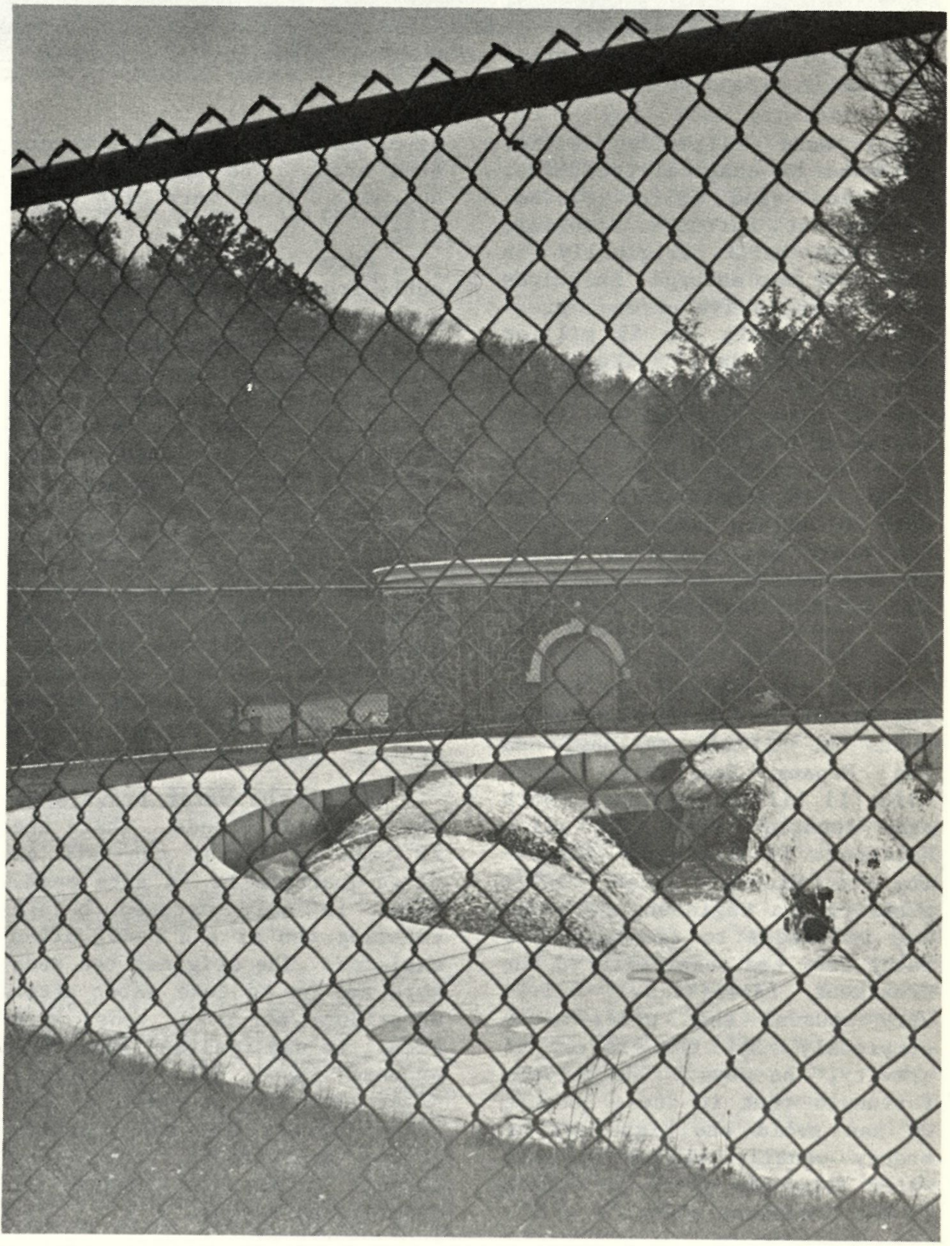
By Audrey Handelman,
Environmental Intern

Thousands of years ago, water was boiled, strained, or allowed to settle before it was drunk. These procedures were looked upon not as safety measures but as aesthetic ones, designed to make the water look and taste better. They did, however, significantly decrease the health hazards associated with contaminated water, although it was not until the 1850s that scientists began to suspect that water might carry diseases.

Today there are strict laws designed to protect public water supplies from contamination and to detect it if it does occur. The instant availability of clean, safe, aesthetically pleasing drinking water has become a public expectation and often a governmental priority.

Where does the water come from which flows out of the taps of city and surburban residents, such as the more than 400,000 in the Hartford area? What happens to it before it reaches the consumer? Are there any guarantees that it will be safer to drink than the crudely treated water of ancient times? A tour of the Metropolitan District Commission (MDC) water treatment facility in West Hartford reveals the many steps involved in treating "raw" water to make it potable.

MDC treats water in two ways: by slow sand filtering or



Audrey Handelman photos

Water undergoes aeration at Metropolitan District Commission's slow sand filtering plant, which processes 55 million gallons per day.

MDC's rapid sand filtering plant at Hartford Reservoir #6 processes 20 million gallons per day, will eventually expand to 80 million gallons.

rapid sand filtering, either followed by chemical treatment. The slow sand filter system, located at Hartford Reservoir #5, was built originally in 1920. It was enlarged in stages until 1960 to its current processing capacity of 55 million gallons per day. The rapid filtration system, located several miles north of the first system at Hartford Reservoir #6, was constructed in the late 1960s. At present, it handles only 20 million gallons per day, but there are plans to expand it, eventually, to a capacity of 80 million gallons per day.

The two systems are fed by the Barkhamsted Reservoir, which holds 33 billion gallons, and the Nepaug Reservoir, which holds 11 billion gallons. Both are located about 25 miles northwest of Hartford. According to Richard Allen, MDC's purification engineer, no pumping is needed to transport the water from the reservoirs to the treatment facilities. "It's very unusual that water moves completely by the force of gravity," he says. "We're very fortunate that it does, because we can avoid the high cost of energy usually needed to pump water from its place of origin to the treatment plant.

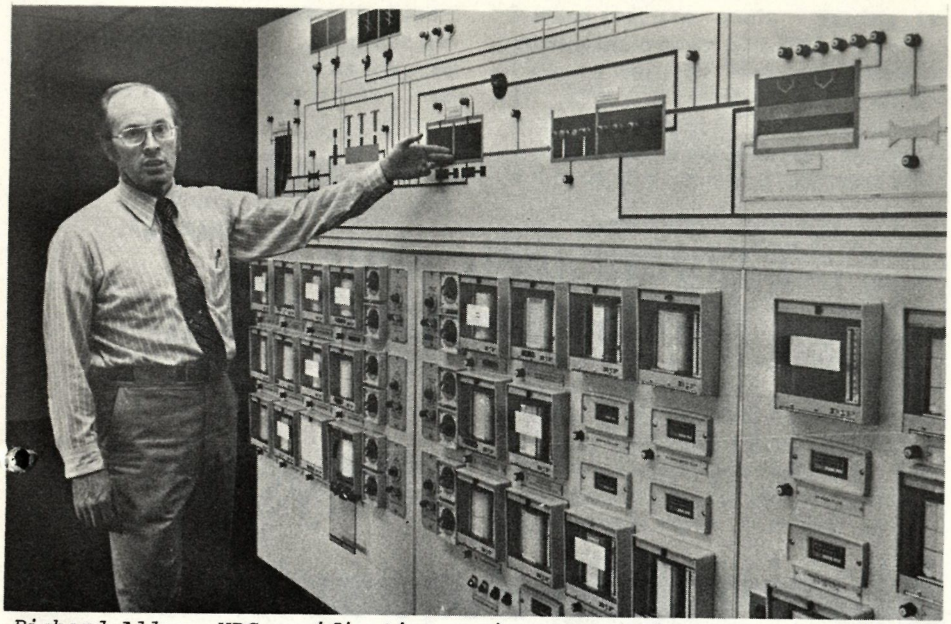
"We're also lucky that there is hardly any industrial development in the entire watershed area. The water we start out with is of very high quality."

Even so, water drawn directly from the reservoirs is not considered fit to drink. The first process which some of the water undergoes upon reaching the slow sand filtering plant is aeration. During aeration, which is also accomplished solely by the force of gravity, the concentrated gases in solution, such as hydrogen sulfide (rotten egg odor), carbon dioxide, and volatile organics which cause unpleasant odors and tastes, will diffuse into the atmosphere. Other chemicals, such as inorganics, may become oxides and settle to the bottom of the tank as particulates.

Next, the water travels to the sand filter beds. There are 22 beds of either one-half or three-quarters of an acre each. Water is only aerated before entering ten of the beds, Allen explains. The original ten beds were set up to take water after aeration; as more beds were added, it was realized that this process was not essential. After aeration is complete, the water travels completely underground or indoors, travelling through pipes or stored in underground basins.

After flowing through the sand filter beds, the water is on its way to one of two underground filtered water basins with a combined capacity of 15 million gallons. From the outside, the basins appear to be ordinary grassy fields with sloping sides. Just before entering the basins, the water is injected with various chemicals from the chemical treatment building. Although the filtration process has removed most particulate matter and much bacteria, the water is not yet of drinking quality. In the basins, the water will be gradually and gently mixed to insure even distribution of the chemicals.

Among the chemicals added to control bacteria is the most common of disinfectants, chlorine, which is stored, along with the other chemicals in the chemical treatment building. "These chemicals are all deadly poisonous in large quantities," says Allen, "So we have to be very careful." With the chlorine, for example, there is a device in the tank storage room which senses chlorine in the air in concentrations of as little as one part per million. In the event of a leak, the sensor would activate an alarm. "There is an emergency procedure to deal with leaks," says Allen, "We have a special steel tank in the storage room, and we would get the leaking tank into it as quickly as possible." The



Richard Allen, MDC purification engineer, explains controls at MDC's rapid filtering plant.

emergency chlorine encasement tank is equipped with a pipe system, however, so that no chlorine would be wasted and it would still flow into the water.

In addition to chlorine, fluoride, hydrated lime, and an anti-corrosive chemical are added. On the lower level of the chemical treatment building, a dazzling array of brightly colored pipes criss-cross overhead. "That's our color-coding system," Allen explains. "Each pipe is identified by color, and marked with the chemical name and the direction of flow. In an emergency, we would have to be able to locate a leak very quickly."

There are at least three or four checkpoints along the way in the process of adding each chemical. Chlorine flow, for example, is monitored in the following ways: the weight loss from each tank is measured as chlorine flows into the water; flow rate is measured; a continuous analyzer measures the amount of chlorine present in the water immediately after treatment; and the water, after treatment, is tested daily in the plant laboratory.

The water is regularly checked not only at the plant but also at various points around the distribution system. "We test daily, semi-weekly, weekly, or monthly, at the outermost points of the system and at the points of highest population density," Allen says. "This way, if there is no contamination at either end of the system, we can be fairly sure that there is none in the middle."

Testing for bacterial contaminants is done by measuring the parts per million of a certain genus of bacteria, the coliforms, in the water. These bacteria are found in large numbers in the intestines of warm-blooded animals; they pass with the feces into water, where they survive but do not reproduce. Their presence indicates the possible presence of those organisms which cause dysentery typhoid, cholera, and other waterborne bacterial diseases. In addition, several physical tests are performed for pH, turbidity, and color.

Such testing is done in order to comply with the U.S. Environmental Protection Agency's national drinking water regulations of 1974, which require all public water supplies to be monitored and tested constantly for contamination. Today, however, many people worry about contaminants whose characteristics do not fall within the parameters of the 1974 Safe Drinking Water Act. Viruses, carcinogens, antibiotics, or hormones may not be detected in routine testing.

The MDC's slow sand filtering system is a much more labor intensive operation than the rapid filter system. Cleaning the slow sand filters, which must be done once every six to eight weeks, takes two men two days per filter--and there are 22 filters. Cleaning the filters involves draining all but about a foot of water out of the bed and lowering a tractor, by crane, into the bed. The tractor is driven around the bed and stirs up the filtrate, which is washed "down the drain," so to speak, through pipes which lead to an unused reservoir. This reservoir, occasionally used for the generation of hydroelectric power, acts as a natural settling basin. Every ten years, the filters must be cleaned completely, a process which involves shoveling all of the sand out by hand and takes 20 men ten weeks per filter.

Although the rapid filtering system must be cleaned once every two days, this can be done in 15 minutes with the flip of a switch. The sand is "backwashed" by forcing water back through it under pressure. The backwash water, which may amount to one to five percent of reserves, is then piped back into the reservoir for reuse. The sludge, or solid waste left from filtering cleaning, is dried in the sun on a drying bed and not allowed to recontaminate the system.

There are 58 people working at MDC's two facilities, but only ten of these workers are employed at the rapid sand filter plant. Many have jobs related directly to the water treatment process, such as monitoring flow in the control room, cleaning filters, or doing laboratory testing. Others are involved in the maintenance of the plant, plowing the 17 miles of roads, doing routine construction and repair of buildings, and keeping the many miles of shoreline around the two reservoirs free of debris and overgrowth. ■

Cooling their seals
. . . just part of housekeeping at

Mystic Marinelife Aquarium

Mystic Marinelife Aquarium: Coral Reef exhibit

The Commissioner of Environmental Protection . . .hereby permits Mystic Marinelife Aquarium to discharge:

- * 400,000 gallons, twice per year, of dolphin tank drainage
- * 200,000 gallons, four times per year, of outdoor exhibit pool drainage
- * 60,000 gallons, six times per year of outdoor seal pool drainage

Etc. You saw them here--figures to give pause to anybody who's ever managed operations and maintenance of even a household goldfish bowl.

At Mystic Marinelife Aquarium water--and water quality--isn't easy to forget. There's an awful lot of it, in several dozen tanks and pools. It's vital to the health and happiness of about 2,000 fish and marine mammal residents. And most of it is as clear as glass, so the 6,000 or so persons who may show up on a busy day can easily see underwater antics of fish, grey and harbor seals, or an elephant seal snoozing at the bottom of its pool. Seeing is important--over 620,000 visitors came to see the fish and animals in 1981, according to public affairs director Julie Quinn, making the aquarium the State's most popular tourist attraction.

Marinelife Aquarium is a division of Sea Research Foundation, Inc., a non-profit educational and research organization. Educational activities--geared to everybody from preschool children to senior citizens, and ranging from pajama parties for the young and wakeful to talks and concerts for the sedentary to shark collecting expeditions for the adventuresome aquarium member -- are taken seriously. Six teachers are now members of the staff. For those who can't make it to Mystic, three of them, as well as adult volunteers, take programs and live animals out to schools and convalescent homes. Research, too, is serious business; and sea water chemistry, marine mammal husbandry, and consultation on life-support systems for aquatic organisms are staff specialties.

Steller's sea lion, Kojak

But Marinelife Aquarium is also just plain fun. It starts right out in front where visitors lining up to enter the aquarium can watch Steller's sea lions Kojak, Delilah, and Jezebel in a 34,000 gallon pool. Kojak has learned 20 "behaviors," proving surprisingly trainable. At an adolescent 1,500 pounds, and expected to hit 2,000 when he's full grown, Kojak commands attention however he "behaves."

Inside the building, 34 living exhibits range from 200 gallon tanks to a 16-sided, 30,000 gallon circular tank whose exhibit of Atlantic sharks up to six feet long is called "The Open Sea." Not only can you look at underwater life, and read about it, you can also get some idea how it feels. At one display visitors peer in and see how the underwater world looks to a fish. In another area, visitors hear how life under water sounds to its residents.

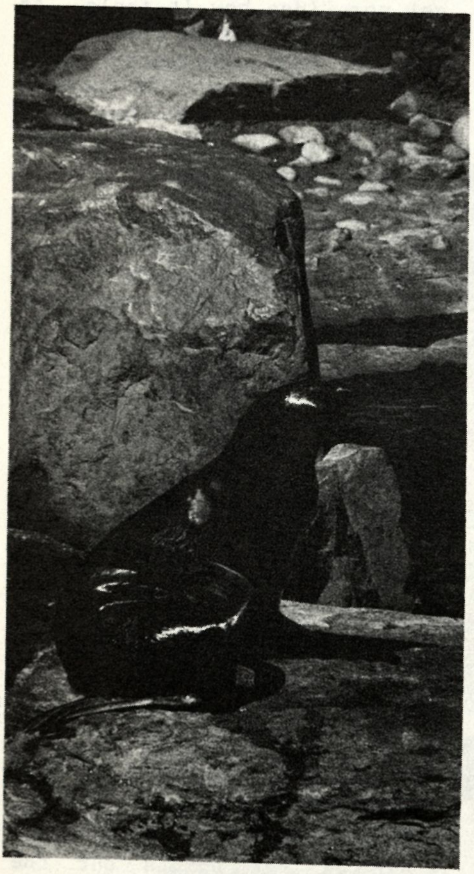
Up a level, in a marine theater that seats 1,400, marine mammal demonstrations are offered hourly year round. The performing animals can also be seen under the water on the first floor. The theater's 350,000 gallon pool is home to Alex, a one-ton Belukha whale, and Okie, a female Belukha. Three Atlantic bottlenose dolphins, who join the whales for performances, live next door in a pair of 30,000 gallon auxiliary pools.

The demonstrations combine a lot of information with the amusement, relating animals' performances to their natural behavior. Lest, for example, you appreciate only the dolphins' physical prowess as Sassy and Kimo leap through a hoop, their trainer points out the difficulties of training dolphins to such behavior. Dolphins, he says, tend toward claustrophobia when faced with something they feel they might get stuck in. During another impressive jump, the trainer explains how a dolphin's eyes let it see down into the water and accurately gauge the depth.

During his performance, a California sea lion named Patrick catches a hoop around his neck. Patrick's protruding eyes and 360 degree vision, along with his flexible neck, contribute to his adeptness at catch. Closer to nature, his trainer points out, they also make it easy for him to catch fish.

Some fascinating facts and figures turn up more or less behind the scenes.

All of the aquarium's fish live in a complex artificial seawater mixture, at temperatures ranging from 45 degrees to 80 degrees, according to Jim Roberts, director of engineering, maintenance, and security. No natural sea water is used, meaning that marine aquariums no longer need to be located on the shoreline.


Northern fur seal

The dolphins and whales, Roberts says, live in a simple table salt and tap water mixture -- the salt is for their skins, and they don't drink the water. Dolphins and whales are kept in 65 to 72 degree water to keep them active and willing to perform. "At 80 degrees, they get lazy," says Roberts. "At 90, they'd quit."

The seals and sea lions of Seal Island, just beyond the Main Building, live in fresh water, but a seal may occasionally get a salt water bath in a special holding pool if it has skin or eye problems.

Seal Island's three exhibits include the "New England Coast," whose 50,800 gallon pool contains harbor seals and grey seals; a Pribilof Islands display whose 109,120 gallon pool holds northern fur seals from off the Alaskan coast; and a California Coast exhibit whose 2,250 square foot pool's occupants are California sea lions and northern elephant seals.

According to Stephen Spotte, the aquarium's director, the design of the life-support system at Seal Island is more advanced than that of any other pinniped holding facility in the world. The staff designed the powerful filtering system; 340,000 gallons from the three-pool complex pass through the four filters once every two hours. In the rapid sand filters the water is chemically treated to remove bacteria and other micro-organisms, and small particles are filtered out to maintain the crystal clear water.

Seals and sea lions are indigenous to cold waters, so two 200-ton refrigeration units keep their three pools' waters at an average temperature of 65 degrees -- so visitors see the animals alert and active even on hot summer days.

The backdrops of all three pools are made of a strong, lightweight concrete and fiberglass material, colored and arranged to closely resemble the animals' natural habitats. Latex rubber molds for the cliffs were taken from a natural cliff in Massachusetts.

All the exhibits' beaches slope toward the pools, making it easy for keepers to hose them off each morning. The New England Coast exhibit is less steep than the other two, to accurately depict the Eastern shoreline and because the true seals (or phocids) which live there are less agile on land than sea lions (otariids) and are unable to climb the rocks and escape.

While the true seals are not climbers, they are swimmers -- the young of many of these animals can swim strongly within hours of birth. California sea lions, on the other hand, do not swim for their first few days, and northern fur seals may be several weeks old before they enter the sea.

Because of this, many exhibits lose young animals which fall into deep pools and drown. Marinelife Aquarium solved this problem by building the California Coast and the Pribilof Islands exhibits with tidepools fronting on most of their beach areas. The tidepools are formed of grated platforms, set close to the surface and edged with boulders which keep the fur seal and sea lion pups from entering deep water. The platforms are disguised with loose cobbles, but the grating allows the water to flow through easily for filtering.

Engineering problems in a facility like Marinelife Aquarium are varied. The holding pool backstage from the exhibit areas, in which seals can be held for treatment, is small, to allow access by the staff. It has its own filtration system, so brine can be used to soak animals with eye or skin problems. A surface skimming system takes care of floating debris like fish oils. And a sump system solves the problem of overflow combined with low water levels which occurs when a very large animal climbs in and out of a very small pool.

The goings and comings of animals are also part of Roberts' responsibilities. This can involve anything from shipping a fish out in a simple plastic bag inside styrofoam and cardboard boxes to moving out a 1,200 pound sea lion in a 1,500 pound cage, cooled with crushed ice or a spray of water. As Roberts describes it, tongue in cheek, "You have to be careful not to bend the whale or chip its veneer."

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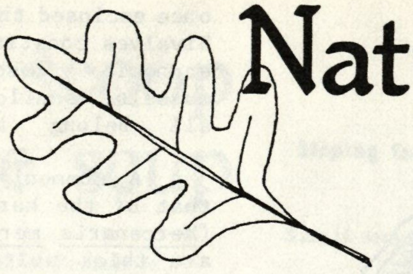
Nature Notes



by Penni Sharp

Out of their shells . . .

Summer is traditionally a time for vacationing, and many people head to the shore to enjoy the beach. Beaches offer relaxation and pleasure to visitors -- sunworshipers, swimmers, picnickers and birders alike.

Almost no one who goes to the beach can resist the temptation to "beach comb." It is always fascinating to see what the tides have cast upon the shore.

Sifting through the debris at the high tide mark, one is apt to come upon all manner of objects from seaweeds and driftwood to old sneakers and Clorox bottles. Remnants of our throwaway society are sure to be found on any beach! But one can also find many treasures from the sea, and it is always a challenge to search for the unusual along the lines of a receding tide.

Collecting shells is a fascinating hobby that can be pursued on any of Connecticut's beaches. Although our shores may not offer the rich and colorful variety of shells that, for example, are found on parts of the Florida coastline, there is a modest diversity of shells to be found which are representative of a number of creatures that dwell in the waters of Long Island Sound.

Low tide is probably the best time to hunt for shells. At that time, many rocks and areas are exposed that might at other times be inaccessible. During new and full moons, unusually low ebb tides occur and this is worth bearing in mind. Beach combing can be very interesting after storms. Although turbulent waters may be hard on some shells, many deep water specimens are torn loose during storms, and these are sometimes deposited upon beaches.

Those who collect shells are quick to learn where to look for specimens. Small delicate shells are usually found following a calm tide, high on the beach among all the material left behind by receding waters. Large shells should be looked for where the tide has deposited larger and coarser debris. Minute shells may be found attached to or within seaweeds, driftwood, or larger shells.

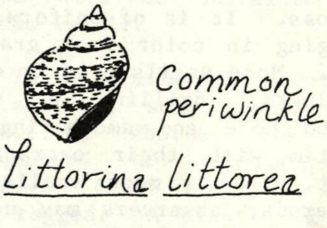
Shells can certainly be appreciated for their intrinsic beauty; however, knowledge of the animal which created a shell adds a new dimension to collecting. Most of the shells found on a beach have lost all traces of the creatures which fashioned them and used them for shelter. However, there are a number of field guides which are useful in identifying shells and which may provide information about the creature within.

Animals with shells belong to the group, or phylum, Mollusca, a name meaning "soft-bodied." Members of this large group are commonly called mollusks.

Anyone who has spent time either looking at or collecting shells has probably observed that there are two distinct types -- those with double shells and those of a single unit. The single-shelled varieties are called "univalves" and belong in the class Gastropoda. The others, called "bivalves," are members of the class Bivalvia.

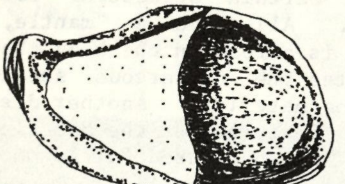
Members of both classes share certain structural features. All have a "mantle," which is a fold in the body that secretes the calcareous shell-forming material. Another distinct feature is the muscular "foot" which is used for locomotion.

Some univalves that can be found at Connecticut beaches include the common periwinkle, common slipper shell, northern moon snail, and channeled whelk.



The common periwinkle (Littorina littorea) is ubiquitous along our rocky coast, this being the common winkle on rocks and wharf pilings. The periwinkle is a whorled sea snail of rather drab colors that grows to about an inch in size. The common periwinkle is not native to America and is said to have been introduced to Nova Scotia in the early 1800s. Periwinkles are vegetarians and feed on algae. They are exposed during low tide and can tolerate long periods out of water. Although not brightly colored, periwinkles can have interesting patterns and subtle shades of browns.

Common slipper shells (Crepidula fornicata) are interesting shells that are aptly named. A small platform or deck extends halfway across the opening, giving the shell the appearance of an odd-shaped slipper or shoe. They are also known as boat shells. The shells are brownish in color with darker markings, and these creatures live in shallow water attached to rocks or other shells. They grow to a size of an inch and a half and are often found piled upon one another in large stacks. Slipper shells are a common beach shell and are most abundant along protected bay areas.

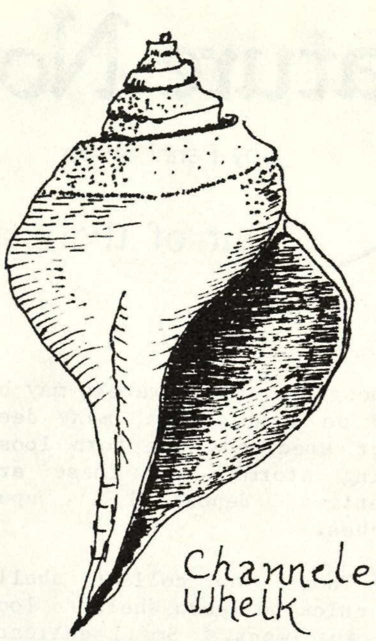


Common Slipper shell
Crepidula fornicata

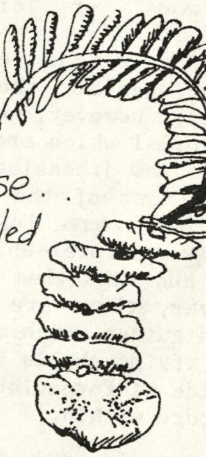
The northern moon shell (Lunatia heros) is a large snail that can be up to four inches across. It is of uniform hue, ranging in color from gray to tan. Moon snails prey on other mollusks, drilling a small round hole and smothering the victim with their extra-large foot. Where moon snails are numerous, observers may notice round "collars" of sand. The snails secrete a gluey substance which binds grains of sand together. Within these collars, moon snails deposit their eggs.

The channeled whelk (Busycon canaliculatum) is the largest snail found on the Atlantic coast. The distinctive spiral shape separates whelks from other snails. They feed chiefly on bivalves, using their tapered anterior to pry open their prey. Whelks are popular beach shells, but are not always found intact. Most beachcombers have probably come across the interesting egg case of this mollusk. These are long strings of horny capsules, each containing hundreds of minute, perfect shells.

Numerous bivalve shells are found on Connecticut shores. By the time the shells wash up on the beaches, the bivalves are usually no longer hinged, belying the fact that two shells



Channeled Whelk
Busycon canaliculatum



EGG case
Channeled Whelk

Blue Mussel
Mytilus edulis

once enclosed the animal inside. Bivalves constitute an important economic resource -- clams, mussels, scallops, and oysters all belong in this group.

A commonly found shell is that of the hard clam or quahog (Mercenaria mercenaria). These are thick white shells with a dark purple stain on the inside shell margin. The Indians fashioned small beads called wampum from these shells; the beads were strung into strands or belts and used as currency. The purple beads were highly prized. The clam's Latin name, Mercenaria, derives from its use as Indian money.

The quahog is the popular chowder clam. Commercially, this same species is known as the littleneck, cherrystone, or chowder clam, depending on its size.

Living clams are found in sand or mud near the low tide mark. They grow rapidly, reaching the mature size of three inches in a few years. If not devoured by a gull or tossed in the chowderpot, quahogs may live for 25 years.

The blue mussel (Mytilus edulis) is a glossy blue-black shell with a pearly-coated violet inside. The blue mussell can grow to approximately four inches. Mussels anchor themselves firmly to inter-tidal rocks and pilings with their tough byssal threads. In this stationary position, mussels siphon water that brings them food and oxygen. Mussels are a tasty treat and can be gathered relatively easily.

(In Connecticut, recreational shellfishing is regulated locally. Contact local shellfish commissions or town health departments to find out about regulations, licenses or permits needed, and residence requirements. The Connecticut Department of Health Services publishes a list of areas closed because of potential health hazards -- call 566-2762 or write Environmental Health Services Division, DOHS, Rm. 416, 79 Elm St., Hartford, CT 06115, and request "List of

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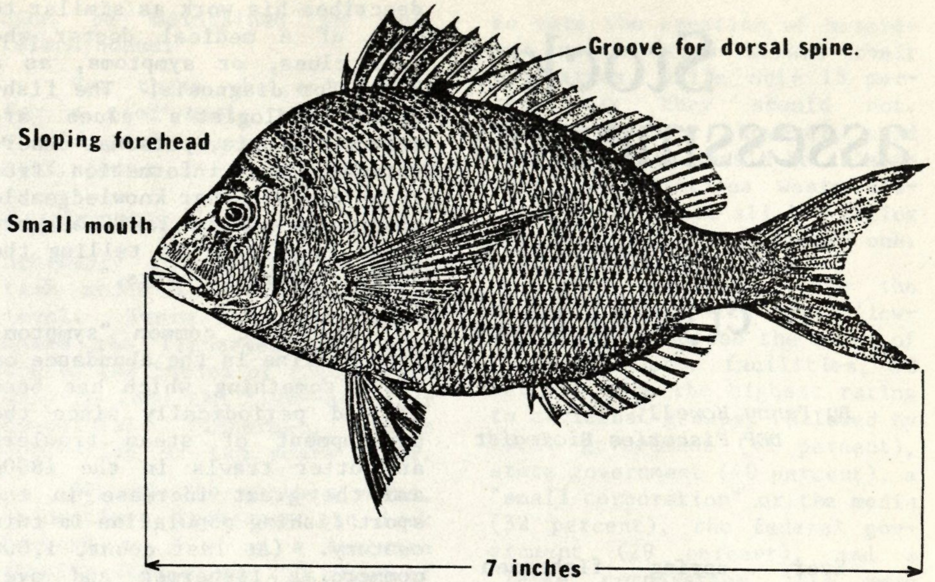
The scoop on the scup

By Julie Eckhardt,
Student Intern,
Trinity College



SCUP/PORGY must be 7 inches total length to keep!

Stenotomus chrysops, commonly known as the scup or the porgy, has long been a popular catch on Long Island Sound. Both commercial and sport fishermen have always enjoyed bountiful catches of scup because of its abundance and its willingness to take bait. At present, the scup is so popular that there is concern that the scup stock, like other marine fish stocks, is being too heavily exploited.

The scup is a continental shelf species ranging between Cape Cod, Massachusetts, and Cape Hattaras, North Carolina. Scup are schooling fish which subsist on crustaceans, worms, young squid, and invertebrates. Commercially the fish are harvested all year: in the South using trawlers during the winter and off the shores of New England and New York in the spring and summer months using floating traps, pound nets, and trawls. From May through July these fish migrate into nearshore areas along the New England Coast to spawn, and the angler can merely venture out in a small boat with a good bait to prove successful.

Commercial scup landings from New York and southern New England have declined steadily from 25,355 tons in 1960 to 2,536 tons in 1976. Commercial fishing effort data are unavailable for this period, so it is uncertain whether the recent decline in landings was due to changes in fishing pressure or a natural variation in stock abundance. Because the scup is a schooling and long-lived fish, the stock and catch can fluctuate considerably over the years. It becomes extremely difficult to gauge the health of the stock from landings, and commercial fishermen have learned not to depend on a consistent catch of this species.

Sport anglers have fared better in recent years in pursuit of scup. Recreational landings by Connecticut's sportsmen have increased from over 487 tons in 1978 to over 692 tons in 1980. Continued angling pressure on the scup is forecast for the future, since saltwater sport fishing has been growing at a rate of about 600,000 anglers per year in the United States.

Because of the economic and recreational importance of the scup in Connecticut, the Connecticut Department of Environmental Protection began a five year study in 1980 on the current status of the scup stock in Long Island Sound. Penelope Howell, a research biologist concerned with the scup's future, emphasizes that the research efforts are not attempts to "go out and regulate the fishery." Rather, it is hoped that this research will provide recommendations for an effective management policy for the scup, so that the population will be sustained at optimum levels.

To determine the numbers and ages of scup caught off Connecticut shores, the DEP implemented a tag-recapture program. Close to 4,000 scup were tagged. A plastic fluorescent orange tag was attached to their dorsal fins. On each tag was a request that the tag be returned to DEP's Marine Fisheries Unit in Waterford with a statement of where and when the fish was caught. As an enticement to return the tag, a three dollar reward was offered.

From tags returned and measurements of the catch made at dockside, it was found that once scup enter the Sound and spawn, most stay in the same place through mid-summer until they begin their migration south in early fall. Also, the researchers found a significant difference in the lengths of fish caught by inshore commercial fishermen and sport fishermen. Of the scup caught by the sport fishermen, only 15 percent exceeded nine inches whereas 75 percent of those caught by commercial fishermen were over nine inches in length. These results show that the sport

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Stock assessments:

the scientist's crystal ball

By Penny Howell,
DEP Fisheries Biologist

Every spring fishermen eagerly prepare for the annual return of the many species of fish that move into Long Island Sound's bays and coves to spawn and feed. Recreational and professional fishermen alike know that a good catch depends on careful attention to the idiosyncrasies of the quarry, and long ago folklore developed to help predict the arrival of each spring migrant. For instance, old time Rhode Island fishermen used to time the scup migration with the flowering of dandelions, while "old salts" in Virginia and on Long Island predicted the arrival of shad by the flowering of the shad bush and of weakfish by the dogwood or lilac. The interval between the flowering of the two trees was considered an indication of the success of the weakfish season.

Although more recent attempts to assess the Sound's fish populations have used information more directly related to the biology of the fish, predicting the success of a given fishing season is still a tricky business. The process, called a stock assessment, is done by the biologists in the Department of Environmental Protection's Marine Fisheries program.

Stock assessment includes an evaluation of the effect of fishing on the current numbers and growth of a fish species and the outlook for future effects. One biologist, who has conducted several such assessments, describes his work as similar to that of a medical doctor who uses clues, or symptoms, as a basis for diagnosis. The fisheries biologist's clues are scientific data, personal observations, and information from fishermen or other knowledgeable observers. This last category would be similar to telling the doctor "where it hurts."

The most common "symptom" is a decline in the abundance of fish, something which has been noticed periodically since the development of steam trawlers and otter trawls in the 1800s and the great increase in the sport fishing population in this century. (At last count, 1,000 commercial fishermen and over 300,000 anglers enjoy the fishing from Connecticut's shores.)

DEP biologists keep track of important fisheries by looking at total catch and total fishing effort to see how catch and catch per unit of effort vary throughout the season. The biologists then add their own catch data from a research vessel which trawls using different size nets to get all sizes of fish from several areas in the Sound.

The analysis of these data is organized around simple biological principles: animal populations increase through growth and reproduction and decrease through mortality from natural causes or from harvesting. Under stable environmental conditions, in an unfished population reproduction and growth are balanced by natural mortality, and the size of the population stays within a certain range year after year. When fishing is introduced, the initial size of the population is reduced and more food becomes available. All things being equal (and they never are) the remaining fish in the population then produce a surplus which is available to be taken by fishermen.

In order to maintain a population at stable levels, fishing should remove exactly the same number of pounds of fish as is generated by reproduction plus growth minus natural mortality. Fishery biologists have developed mathematical equations that attempt to describe these relationships. Computerized versions are referred to as surplus production or yield models. These models cannot include all possible sources of variation in the numbers of fish available year to year, and herein lies the problem with using models to predict the fishing success of a given year. However, long term fluctuations generally can be fairly well documented.

One of the most important sources of variation in the increase, or production, of a given fish population is in reproduction and growth of young fish. For species which reproduce in coastal marshes, inlets, and brackish backwaters--which include 70 percent of the fish species we eat--growth may be particularly sensitive to environmental conditions in the nursery grounds, even though these areas may be a minor portion of the species' range and the time spent there may be a fraction of the lifetime of any fish. A heavily fished stock is more susceptible to such environmental fluctuations, be they natural or caused by human pollution, than is a less popular stock.

Heavy fishing often leaves only young fish in the population, and, with a shorter lifespan, growth may become unpredictable and the numbers and sizes of the fish caught by fishermen quite variable. Wide fluctuations in numbers of different species may be of little ecological importance but may cause economic disaster for fishermen who make their livings hauling nets.

A biologist's yield model tries to predict these fluctuations, so that regulations on the fishery can be enacted to minimize or prevent them. Stock assessments make it possible to enact regulations which will put the least burden on the fishing industry and the fishing public. Regulations can be enacted before a large decline occurs, when more restrictive regulations or moratoriums would be

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Scup

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fishery exploits the younger and smaller fish in the summer before they have a chance to grow and to become available to the commercial fishery in the fall and winter.

The catch statistics showed that scup between six and eight inches dominated sport fishermen's catch. These scup are less than three years old. And because young scup grow much faster than older scup, most seven inch scup taken after August are only one year old. Continued fishing of these young scup does not give the fish a chance to spawn even once in the following spring.

As of January 1, 1982, Connecticut sport fishermen must abide by the same regulations that have long been imposed on commercial fishermen; that is, all scup that are not at least seven inches in length must be released unharmed.

This new regulation should assure that more young scup will now have the chance to reproduce at least once before being harvested. Although there may be a reduction in the number of scup available to sport fishermen this summer, the regulation will enable the spawning stock size to increase, thus enhancing a sustained scup population on the Sound's spawning grounds.

Effective management strategies for the scup aim at protecting the stock from overfishing as well as maximizing the yield to all the fisheries. Although New York and Massachusetts have provided useful data supplementing Connecticut's research on the scup, Connecticut is the first state to impose a length regulation for the sport fishery.

Much is still to be learned about the scup. The study under way will continue for at least three more years. According to Howell, once the growth pattern of the scup is better understood, it will be eaier to plan for the protection and the sustained harvest of the scup. The main concern is that a healthy and stable scup population be maintained in Long Island Sound.

For those who enjoy scup for a good meal, this season should prove just as tasty as past seasons. ■

Assessments

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necessary to preserve a local fish stock at even a minimum level. There are some states where the fishermen have been spared the burden of regulations only to lose the fish--and, for commercial fishermen, their jobs--five or ten years later.

So, as the weather warms, Connecticut fishermen can look forward to finding a favorite fishing spot along 250 miles of coastline which supports more than 20 species of fish that are good sport and good dinners. And it's a safe bet that there will be many more years of good fishing in the Sound, even if the dandelions and dogwoods don't bloom on time. ■

Survey

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caution that such statements should not be taken as precise predictions of behavior since it is a good deal easier to tell an interviewer that one would move than to actually do it. Nevertheless, these data indicate that proximity to a site would be a matter of some concern, and that proper handling of waste is considered of primary importance.

Public preferences and values support centralized, supervised disposal sites. Connecticut residents fear that many hazardous wastes may not be properly handled. Seventy-nine percent of those surveyed feel that industry will handle the problem only if forced to by the government. At the same time, industry is held responsible for dealing with this problem in terms of paying for proper handling now and remedying the results of past damage, even if accidental. Opinion was almost equally divided as to whether generators, other private companies, or the government should run disposal sites.

Seventy-six percent of respondents believe that municipalities should have the power to veto the creation of hazardous waste sites within their boundaries, while only 15 percent say they should not. Seventy percent, however, said that the State should be able to select a hazardous waste disposal site should all 169 cities and towns refuse to accept one.

When asked to rate the accuracy with which the following groups assessed the risks of hazardous waste facilities, 52 percent gave the highest rating to citizens' groups, followed by local government (42 percent), state government (40 percent), a "small corporation" or the media (32 percent), the federal government (29 percent), and a "large corporation" (14 percent). A substantial majority felt that large or small corporations and local, state, or federal governments tended to understate the risks connected with hazardous waste disposal. The media, on the other hand, was thought to overstate the risks involved, as were citizens' groups. (Source: *Hazardous Waste Management : A Connecticut Perspective*, Vol. 2, Number 3, March/April 1982. ■

Access

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elaborate mansion, you have to be careful to preserve the architectural character.

Portions of some parks will never be accessible. Penwood State Park's sheer drops, for instance, eliminate any possibility of wheelchair access. The Fort Griswold monument, with its narrow, winding staircase, is another example of a facility where it is not feasible to provide handicapped access.

Next summer, Smith says, a planned new edition of the Office of Parks and Recreation's pamphlet, "Recreation in State Parks and Forests," will include the international symbol for handicapped access next to each accessible facility or service listed.

Until then, Smith suggests that handicapped persons intending to use an area contact the park staff if they have questions about access. ■

Wildlife . . . and wonderful

By Julie Victoria
Dep Wildlife Biologist

Attention wildlife buffs, crossword puzzle enthusiasts, and trivia collectors: Ever wonder what bird is the largest or what are some of the fastest animals around? Well, collected from a variety of sources, these noteworthy wildlife facts are guaranteed to perk up a lull in any conversation. So, for your curiosity, information, and amusement, did you know that. . .

* The hippopotamus has a stomach over ten feet in length, so large that it can hold 400 to 500 pounds of food.

* Black bears in New Jersey will not only take readily to climbing trees but will also utilize the tree tops for "nesting." A nest similar to that of an eagle is constructed by the bears, using dead limbs and debris. The site is used primarily for loafing and resting.

* The wandering albatross is the largest of all living flying birds and has a wingspan of over 11 feet.

* Squirrels may scrounge about 20 bushels of nuts, seeds, and roots and put them in a number of caches scattered about their territories. However, they have terrible memories and are often unable to find one-tenth of their caches later on.

* One of the fastest creatures in the world is the spine-tailed swift. Swifts have been known to reach speeds of more than 100 m.p.h. in level flight.

* There are only two snakes in Hawaii, and both are caged at the Honolulu Zoo.

* The animal decreed by Cleopatra to be sacred, revered, and protected by all of her subjects was the earthworm.

* The mute swan is not really mute. It hisses when angry and calls its young with a sound that might be described as a feeble bark.

* Frogs are a protected species in China, where they estimate that 6,000 frogs per acre of rice will consume 300,000 harmful insects a day.

* All bumblebees die in the winter; only the queen bee survives to produce another generation.

* The legs of the penguin are enclosed in the skin of the body, which is why their walk is so slow and clumsy.

* The flight speed of the wild turkey has been estimated at about 50 m.p.h.

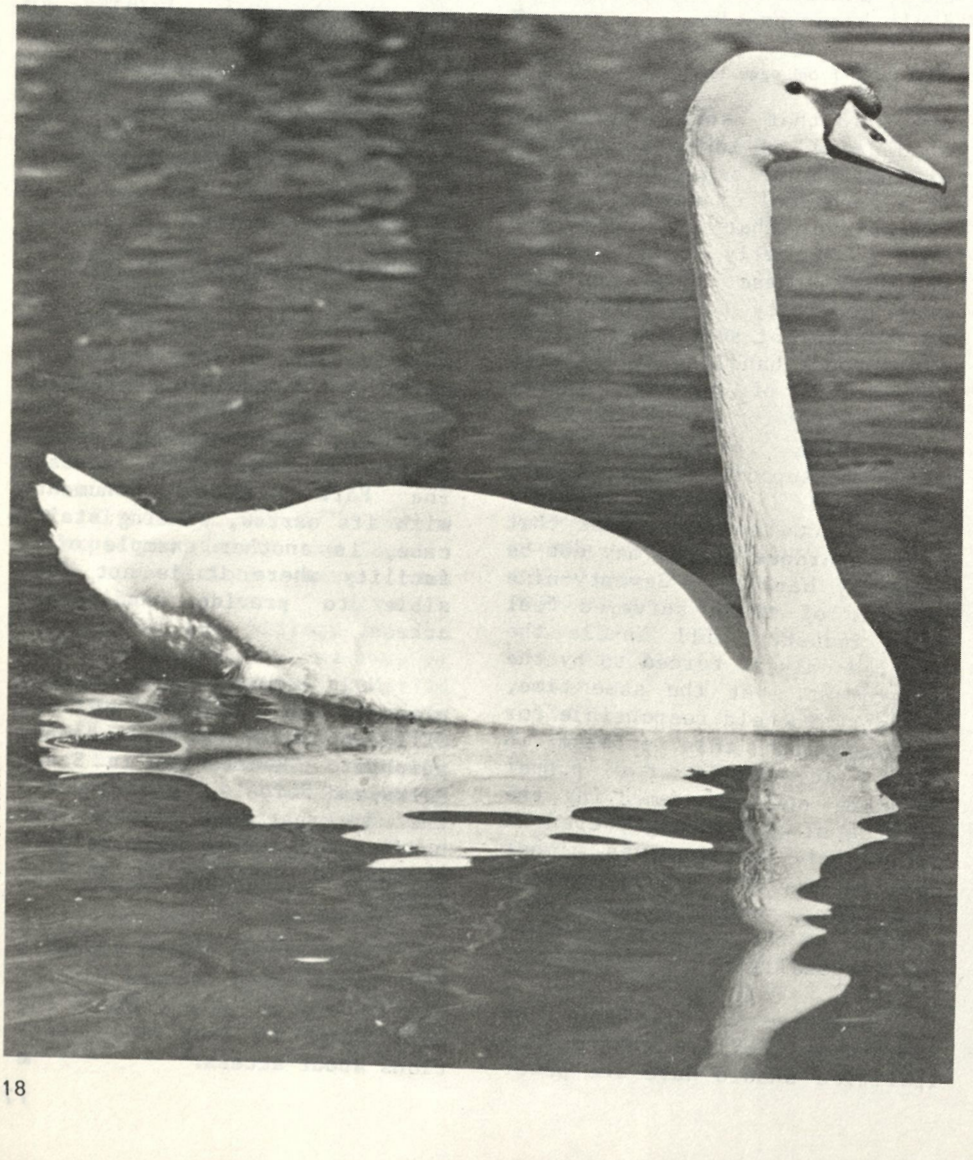
* The dragonfly never walks; its legs are used only for catching prey and as perching gear.

* A car with the acceleration of a striking rattlesnake would go from zero to 60 m.p.h. in half a second.

* Beavers always cut their winter supply of wood in good season. An early cutting generally means an early winter.

* The cricket frog holds the world's record for the standing broad jump--40 times its own length.

* The wings of a butterfly are made up of scales similar to those of a fish. ■



Irene Vandermolen, mute swan

By Leslie Bieber,
Citizens' Participation Coordinator

For Your Information

How citizens feel about hazardous wastes

A poll released by the Natural Resource Council of Connecticut (NRCC) and the Institute for Social Inquiry in February revealed how many Connecticut citizens feel about the issue of hazardous waste. The telephone survey of 500 residents was taken between October 28 and November 4, 1981, for the NRCC and was made possible by a grant from the General Electric Company.

Respondents were first asked what they thought of when they heard the term "hazardous waste." Thirty-six percent said chemicals, and 33 percent said nuclear materials came to mind. The definition of hazardous waste was then clarified to exclude nuclear wastes and to approximate that in the federal Resource Conservation and Recovery Act (". . .any waste or byproduct that could be dangerous to human health or the environment if not disposed of properly. It does not include nuclear waste or radioactive material, but it does include waste materials that are flammable or that could explode").

When presented with a checklist and asked whether each was a major, minor, or no source of hazardous waste, most respondents chose "manufacturing plants" (66 percent), "sewage treatment" (50 percent), and the "chemical industry" (86 percent) as major sources. Between 20 and 50 percent chose as major sources "electrical generating stations" (20 percent), "food processing" (21 percent), the "aircraft industry" (28 percent), and "metal working" (39 percent). Offices, distilling, farming, lumber mills, and photography were generally thought to be minor or almost no source of hazardous waste.

Four out of five respondents thought that the waste generated today would pose a major problem for the next generation. There was scepticism as to whether science would solve the whole problem in the next decade or so. Only one in four felt that the risks from hazardous waste had been "greatly exaggerated."

Connecticut residents, however, do not see hazardous waste as a pressing problem *for them.* The closer to home one gets, the less serious the problem is perceived to be. Eighty-six percent of those questioned thought hazardous wastes were a "very" or "somewhat serious" problem in the United States; 63 percent, when asked about Connecticut; and 28 percent when asked about their own town. Very few employees see their own companies as being major sources of hazardous waste. Most doubt that much such waste is produced in their town, and while a substantial proportion think that their local landfill might contain hazardous waste, only about half describe themselves as worried about that. When respondents were asked to choose among a number of adjectives to characterize their own response to the problem, the majority said "uneasy" (45 percent), or "worried" (24 percent), and only two percent described themselves as "panicky."

Concerns about hazardous waste focus on improper handling of materials. There is a good deal of scepticism about whether most such wastes are properly handled, and the public seems to regard improper handling--as opposed to intrinsic dangers of the material itself--as the greater danger. In keeping with this, Connecticut residents label ensuring treatment of wastes (78 percent) and their safe transport (82 percent) as somewhat higher priorities than limiting their production (68 percent).

More than half claimed they would want to move if a hazardous waste "storage facility" was built within a mile of their home. On the other hand, this proportion dropped substantially if the waste were treated before storage and was halved if the treatment occurred somewhere else. Just shy of half would want to move if untreated wastes were transported over their streets. This proportion was identical to those who would want to move if a maximum security prison was built within a mile of their homes. Pollsters

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Access . . .

opening up parks to the handicapped

By the end of this summer, Thomas Smith of DEP's Planning and Development Unit will have looked at all of the State's 54 developed State Parks and State Forest recreation areas to determine their accessibility to persons in wheelchairs. As part of the State Comprehensive Outdoor Recreation Plan (SCORP), Environmental Analyst Smith is inventorying facilities and services at each area, checking access, and designing changes to make more recreational opportunities accessible where possible.

Smith plans to finish his survey by the end of the summer and compile a schedule of proposed improvements for implementation. Many facilities require only minor adaptations that DEP's own staff members can make, he says. However the Youth Conservation Corps and the Young Adult Conservation Corps, whose members have done many of these projects in past years, were discontinued this year due to federal budget cuts, and without their help it may be hard to get many of the projects done.

Since the Office of Parks and Recreation continually updates facilities, Smith says, recreational facilities are getting more and more accessible to the handicapped. Anything being designed and built currently must, under the State building code, be accessible to persons in wheelchairs. (Smith notes that he is looking primarily at access for those with mobility handicaps rather than at features that might be especially interesting to or suitable for the vision- or hearing-impaired.)

Smith must look at each of the 54 parks and forest recreation areas individually since there are so many variables -- from drinking water and refreshments to boat launches, horse trails, and nature trails to geographic considerations like cliffs and fast-running rivers.

Often, providing access turns out to be easy. At Haddam Meadows State Park, for example, picnicking and field sports areas can be made accessible by shortening some barriers to provide the 34 inch wide entrances required by wheelchairs. At Fort Shantok, a new access route will require his getting the Mohegan tribe's approval to move a post for the addition of a new access route. Ramps, Smith said, are the most frequent modification. At the Quinebaug Hatchery, for example, an eight inch ramp will solve the access problem at the front entrance.

Sometimes changes are small indeed. In some picnic areas you can find picnic tables built with extended tops so persons in wheelchairs can pull up to them more comfortably -- they'll usually be marked with the international access symbol.

Right now, Smith says, a person in a wheelchair can get into 80 percent of the parks if he or she has help. "But we're looking at access by a person in a wheelchair who doesn't have help."

Parks with water-based recreation are gettting his special attention. "We are trying to put handicapped fishing access areas in all State Parks with waters that are stocked with fish." Smith hopes to see five more of these fishing areas added this summer. They will consist of bulkheads which are filled, leveled for access from parking areas, and provided with barriers.

Developing swimming areas for the handicapped in the State Parks is the toughest problem: "Right now there aren't any." In some southern states, padded bituminous walkways allow persons in wheelchairs to wheel themselves right into the water. But, says Smith, "What works in milder climates doesn't necessarily work up here. In this climate, pounding waves, frost, and ice cause extensive damage to these structures."

In some parks, says Smith, making facilities accessible "takes quite a bit of doing." In a park such as Harkness Memorial, for example, with its

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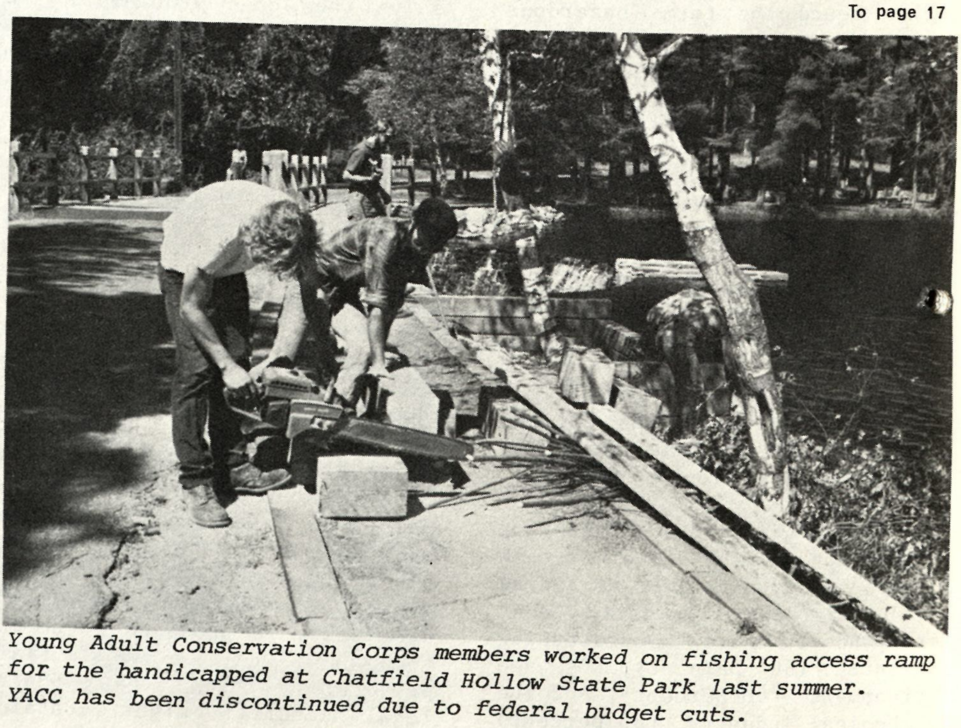


Audrey Handelman

Young Adult Conservation Corps members worked on fishing access ramp for the handicapped at Chatfield Hollow State Park last summer. YACC has been discontinued due to federal budget cuts.

Donation

From page 2

managed by the DEP and will be known as the J. Henry Roraback Wildlife Management Area.

The 415-acre Westbrook property includes the 75-acre Messerschmidt's Pond. This pond supports excellent warm water fishing, and a boat-launching facility will eventually be added to provide access for canoeing and fishing. The land area is suitable for many recreational uses, and some land may be cultivated through agreements with local farmers.

The federal Pittman-Robertson Act taxes the sale of sporting arms, ammunition, and related equipment, and the Dingall-Johnson Act taxes the sale of fishing gear. The P-R and D-J programs provide 75 percent federal support for state wildlife and fisheries management projects and acquisition of land for these purposes. Outright gifts to the State, such as the Roraback gift, can be used as credits for the State's 25 percent share under these programs. They provide state credits good for up to three times their value in federal matching funds, enabling the State to purchase additional lands such as the Messerschmidt's Pond property. ■

With Governor O'Neill for the announcement of the Westbrook purchase were Hawthorne Smyth and Helen Johnson of the Deep River Conservation Trust, Suzanne Wilkins of the Land Trust Service Bureau, State Senator Richard Schneller, and DEP Commissioner Stanley J. Pac.

Don't adopt baby animals

Shortly after the arrival of spring, we see the arrival of many animal babies, including birds, squirrels, rabbits, mice, and chipmunks. Children often capture these animals to keep as pets. Very often they think they've rescued a homeless creature, when actually they have picked up an animal which was on a natural training mission.

Many young animals need constant attention and frequent feedings. Most people cannot duplicate these natural processes, and keeping such animal babies for even short periods can be fatal.

The cute, cuddly babies which do survive grow up into wild animals. . .which can become difficult, and sometimes even dangerous, pets.

One of the most important ecological lessons young naturalists can learn is this: Wild animals have important things to do; they need to be left in their natural habitats.

Youngsters should be taught to leave animals in the wild, and any animal brought home by a child should be immediately returned to the area where it was found. ■

Aquarium

From page 12

Engineering and maintenance members of the aquarium's 80-person staff face some special demands. They have to know their cleaning solutions. They help keep an eye on residents of the tanks and pools. And they are trained to be very careful not to drop things into pools. The whales and dolphins, Roberts says, are trained to return objects dropped into their pools, but a swallowed bolt could be fatal.

Roberts says he found herding the fur seals, which he described as the crabbiest of the animals, out of the way so their pool could be repainted the most exciting of his encounters with animal residents. Working at the aquarium, he says, "You get used to feeling fishy breaths over your shoulder."

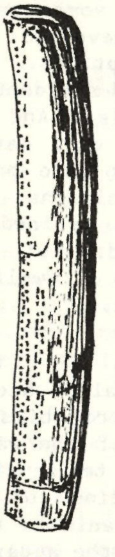
He has become something of a legend among the staff as the only person who has joined the 1,500 pound Kojak and one of his female companions in their front pool. As the aquarium's annual report puts it: "The giant pinniped's natural pugnacity forces handlers to keep a respectful distance." Says Roberts, "I don't feed them, so I figured they wouldn't expect anything from me. They both came over and smelled me."

The value of all the technology, from the realistic-looking surroundings to the powerful filtering and cooling units, shows up, Quinn says, in the success of the aquarium's breeding program, in the almost a dozen seal and sea lion pups which have been born and raised at the facility.

And it's not all just fun for the visitor, she says. "Kids who've seen these animals develop an environmental concern. They care about the marine environment." ■

Sea shells From page 14

Shellfish Closure Areas." Note that towns may have additional closed areas that are not included on this list. At present there is no list of open areas, but several agencies hope to cooperatively publish one in the future.)



Common razor clam

Ensis directus

The razor clam (Ensis directus) is an unusual shaped bivalve -- a long narrow shell that can reach ten inches in length and about one-and-a-half inches in width. They are elusive when living due to their ability to burrow very deeply and to remain firmly entrenched. They live in sandy intertidal zones in an upright position and feed when the tide is in with part of the shell protruding above the sand.

Bay scallop

Aequipecten irradians

The bay scallop (Aequipecten irradians) is a small ribbed symmetrical scallop whose shell has been a widely used motif in art and design. Bay scallops are also referred to as the "blue-eyed scallop" for the rows of tiny jewel-like eyes which occur along the edge of the mantle. Bay scallops live in eelgrass beds in relatively calm waters. They are quite mobile compared to other bivalves and move by a kind of jet propulsion. Strong contractions of the adductor muscle produce jets of water from the mantle cavity and propel the scallop along the sea floor. This large adductor muscle is the edible part of the scallop.

These are just a few of the many shells that are to be found at our beaches. If you plan a vacation at the shore, try looking for these and for others. To add to the enjoyment of gathering shells, take along a field guide and read up on the animals that once called these shells their homes. ■

Wildlife group offers vacations

Before you make those summer vacation plans--for yourself, your teenage children, your junior high campers or for the whole family--take a look at seventeen summer vacations already put together by the National Wildlife Federation.

These back-to-nature vacations, designed for all ages, combine outdoor experiences with conservation education and exploration. The result, according to former participants, is an entertaining, informative glimpse of some of North America's most scenic vacation spots.

For adults or entire families, NWF offers Conservation Summits, six days of exposure to a variety of conservation-related topics in unique settings. This year's summits will be held at five different locations: the Blue Ridge Mountains of North Carolina, June 26-July 2; the Rocky Mountains of Colorado, July 4-10; the Adirondack Mountains of upstate New York, August 1-7; the shores of Green Lake in Wisconsin, August 7-13; and the Canadian Rockies in Banff, Alberta, June 9-15. The Canadian session is NWF's first International Summit, co-sponsored by the Canadian Wildlife Federation.

Summit participants can register for workshops on birds and wildlife, wildflowers, map reading, geology, and fly casting, among other subjects. Teachers and college students can arrange to receive college credit for these workshops.

During their free time, participants can play tennis, ride horses, swim, hike or ski cross country. Evenings bring dancing, films, craft demonstrations, environmental forums, and other entertainment.

For teens and youngsters, Summits provide special programs geared to their interests. Babysitting and daycare are available.

NWF also offers two kinds of vacations for younger adventurers: Earth TREK and Ranger Rick Wildlife Camp.

Earth TREK is a twelve-day program for 13- through 17-year-olds that combines backpacking with environmental study. Designed for beginning backpackers, the program takes co-educational groups of twelve hikers through either the Blue Ridge Mountains of North Carolina or the Colorado Rockies, near Dillon.

Four Earth TRECKS are scheduled for each location. In Colorado, they will be June 24-July 5; July 8-19; July 22-August 2; or August 5-16. Blue Ridge Mountain trecks are scheduled for June 20-July 1; July 4-15; July 25-August 5; and August 8-19. Professional environmental educators lead all groups and Earth TRECK provides backpacks and food.

For the younger camper, aged 9 through 13, NWF has an award winning summer program: Ranger Rick Wildlife Camp. In 12- or 15-day sessions at a campsite near Hendersonville, North Carolina, young campers can pursue energy experiments, bird observation, arts and crafts, fishing, and other activities. This year's session will run June 13-24, July 4-18, July 21-August 1, and August 4-18.

Costs for the Summits for a family of four range from $800 to $1100, depending on location and type of accommodation. Wildlife Camp costs $350 for the 12-day session and $395 for the 15-day session. Earth TREK costs $360 per backpacker.

For further information about NWF's vacation programs, call 703-790-4363, or write the National Wildlife Federation, Dept. PR 82, 1412 16th St., NW, Washington, D.C. 20036.

Groundwater Workshop

The Water Compliance Unit of the DEP and the Central Office of the Connecticut 208 Program are sponsoring a Groundwater Workshop on Tuesday, June 22. U.S. Representative Toby Moffet will be the keynote speaker.

The workshop, which will be held at Beatrice Auerbach Hall at the University of Hartford, will cover many groundwater-related topics. Registration is $15, including lunch. For more information, contact Tess Gutowski, Water Compliance Unit, (203) 566-2588.

Resource Recovery Exposition

On June 17, 1982, hundreds of municipal officials from throughout New England are expected for the First New England Resource Recovery Exposition in Durham, New Hampshire. Participants will tour three operating facilities as well as having the opportunity to talk with exhibitors from all over the country.

The 9:30 a.m. to 6 p.m. exposition will tour the Durham Wastewater Treatment Plant and Composting Facility, believed to be the first with a complete cycle of wastewater treatment; the Lamprey Regional Solid Waste Cooperative, whose three modular incinerators serve 14 communities and supply energy to the University of New Hampshire; and one of the Lamprey facility's satellite transfer stations.

Among the exhibitors will be: incinerator manufacturers; engineering firms; state officials; markets for recycled materials; and trade associations.

For further information contact Elizabeth A. Bedard, Governor's Council on Energy, 2½ Beacon Street, Concord, New Hampshire 03301; 1-800-852-3466.

Audubon Center has moved

The Connecticut Audubon Environmental Center has moved from 69 Lafayette Street to 118 Oak Street, Hartford. Also moving with the Connecticut Audubon were the Sierra Club, Connecticut Cetacean Society, the Conservation Law Foundation, and the Connecticut Environmental Caucus. Any environmental organization in need of office space should contact Karl Wagener, C.A.E.C. Director, at 527-8737.

Permits Issued

Water Compliance

3/22/82: 3M Company, Environmental Engineering and Pollution Control, Saint Paul, Minnesota
To discharge to the Town of Vernon sewerage system an average daily flow of 9,000 gallons per day of wastewaters. Conditions.

3/22/82: Pepsi-Cola Bottling Company of Hartford/Springfield, Inc., Windsor
To discharge 35,000 gallons per day of soft drink bottling wastes to the Town of Windsor Sewerage System. Conditions.

3/22/82: Metals Testing Company, South Windsor
To discharge pretreated metal finishing wastewater to the South Windsor Sewerage System in an average daily flow of 5,000 gallons per day. Conditions.

3/22/82: Windsor Plaza Incorporated, Groton.
To discharge an average of 60 gallons per day of car washwater to the groundwaters in the City of Groton. Conditions.

3/23/82: Billings Forge Associates, Boston
To discharge 20,000 gallons per day of sanitary sewage from the Billings Force Complex, Hartford, to the City of Hartford Sewerage System. Conditions.

Inland Wetlands

3/24/82: Connecticut Dept. of Transportation
To excavate and construct within inland wetlands and watercourses as part of the re-alignment and sightline improvement of Rt. 32 in the Town of Mansfield. Conditions.

3/31/82: Connecticut Dept. of Transportation
To excavate and deposit soil materials in proximity to inland wetlands and watercourses to allow for erection of a noise barrier along I-91 in Rocky Hill. Conditions.

3/31/82: Connecticut Dept. of Transportation
To excavate, grade, and do drainage work within wetlands to allow for removal of abandoned railroad overpass and widening of Rt. 17 in Portland. Conditions.

4/5/82: Connecticut Dept. of Transportation
To excavate, fill, grade, and perform construction and drainage work within inland wetlands and watercourses for construction of an industrial park road in the towns of Middletown and Cromwell. Conditions.

4/14/82: Matthew and JoAnn Ruske, Middletown
To maintain fill within inland wetlands placed for construction of a single family home on Evergreen Road in Cromwell. Conditions.

5/6/82: Peter Veleisis, Woodbury
To maintain approximately 10,000 cubic yards of fill within inland wetlands. Conditions.

Dams

4/21/82: City of New Britain Water Dept.
To repair a dam on Shuttle Meadow Reservoir in New Britain and Southington. Conditions.

4/21/82: Moore Grover Harper, P.C., Essex
To repair a dam on Mill Pond in Essex. Conditions.

Trailside Botanizing

by G. Winston Carter

Partridge berry
Mitchella repens

Partridge berry is a small creeping plant which is commonly found peeping out of the litter of the forest floor in cool woodlands. A unique aspect of this plant is that it bears fruit which appears to have two blossom ends on one berry. This scarlet fruit may persist throughout the year. It usually blooms between April and July. The blossom is characterized by two small, ornamental, pink and white tubular flowers, decorated with fur, which develop from two ovaries that are united. In one of these flowers the pistil develops, the stamens remain undeveloped. In the other, the pistil withers away, and the stamens grow and bear pollen. The combination produces a single scarlet fruit, which is marked with two points.

The leaves of the partridge berry are small, paired, and roundish. The fruit, unless eaten by wildlife or humans, persists through the winter. Although frequently mentioned as being of medicinal value, the fruit of the partridge berry apparently has no such use. It is edible but lacks the flavor of wintergreen.

The partridge berry is found in an acid environment where evergreen needles or oak leaves accumulate in a thick layer that decays very slowly. It often grows in association with Canada mayflower, starflower, and goldthread. In t[illegible] northern forest country this type of ground cover is referred to as the Canadian carpet. Many of the plants that make up this cover have waxy, dark green leaves, are only a few inches high, and, like partridge berry, are well protected throughout winter under the insulating snow-blanket.

DEP Citizens' Bulletin
State of Connecticut
Department of Environmental Protection
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